



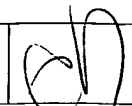
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/836,674	04/16/2001	Sven Lindfors	SEPP11.001AUS	9836
20995	7590	04/21/2004	EXAMINER	
KNOBBE MARTENS OLSON & BEAR LLP 2040 MAIN STREET FOURTEENTH FLOOR IRVINE, CA 92614			SONG, MATTHEW J	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 04/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 09/836,674	Applicant(s) LINDFORS, SVEN	
	Examiner Matthew J Song	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 January 2004.
- 2a) ☒ This action is FINAL.      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7-9, 11-13, 16-18, 20-26 and 36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-9, 11-13, 16-18, 20-26 and 36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/22/2004 has been entered.

### ***Claim Objections***

2. Claim 1 objected to because of the following informalities: Claim 1 recites, "substrateupstream" in line 7. The Examiner suggests changing to "substrate upstream". Appropriate correction is required.

3. Claim 20 is objected to because of the following informalities: Claim 20 recites, "removeable" in line 9. The Examiner suggests changing to "removable" to correct the spelling error. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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5. Claim 36 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 36 recites, "the reaction product is deposition **on in** an independent pre-reaction chamber" in lines 9-10. It is unclear if the reaction product is deposited **on** the chamber or **in** the chamber.

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-5, 7-9, 11-13, 16-18, 20, 22-25 and 36 are rejected under 35 U.S.C. 102(b) as being anticipated by Suntola et al (US 6,015,590).

Suntola et al discloses an apparatus for ALE comprising four reaction chambers **13** having substrates **12** onto which thin films are grown using the ALE process, where vapor phase reactants are fed into a reaction space in the form of vapor phase pulses repeatedly and alternately and evacuating the reaction space between successive pulses (claim 1 and col 3, ln 1-67). Suntola et al also discloses a reactant inflow channel **7** for metallic reactants such as  $\text{TiCl}_4$ ,  $\text{ZnCl}_2$ , hydrogen sulfide and sulfur (col 4, ln 45-60, col 8, ln 30-67 and Fig 1). Suntola et al also teaches starting materials are isolated from each other thus preventing their pre-mature mutual reactions and such reactions occur in the gas phases resulting in a CVD thin film (col 7, ln 5-67).

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Suntola et al also teaches a design target of less than 1% of residual components of a preceding vapor phase reactant pulse remaining at the infeed of the next pulse and the reaction space can be purged to less than 1 ppm of reactant residues from the preceding pulse (col 5, ln 10-35 and col 3, ln 25-40). Suntola et al also discloses the "reaction space" includes the space in which the substrate is located and the gas inflow channels communicating with the reaction chamber (col 4, ln 25-50). Suntola et al also discloses a substrate is place in a reaction space (Abstract and Claim 1)

Referring to claims 1 and 36, Suntola et al discloses feeding a vapor phase pulse, purging the reactor to less than 1% of residual components and feeding in a second vapor phase pulse, as applicant. Suntola et al is silent to a reaction product is formed. This is inherent to Suntola et al because Suntola et al teaches a similar residual amount of first reactant, as applicant (note instant claim 22), and similar reactants, as applicant (note pg 7 of the instant specification); therefore a reaction product is inherently formed.

Also, referring to claim 1 and 36, Suntola et al discloses a inflow channel 7, this reads on applicant's pre-reactor, upstream from the reaction chambers 13, this reads on applicant's second reaction chamber. The walls of the inflow channel 7 read on applicant's first substrate because reactants deposit on the walls of the inflow channel as undesired film growth (col 8, ln 10-17) and substrates 37 in the reaction chamber reads on applicant's second substrate. The flow of gases and the position of the substrates inherently requires the first reactant and second reactant to be feed over the first substrate and subsequently over the second substrate.

Referring to claim 2, Suntola et al discloses a vapor phase reactant pulse (col 9, ln 10-20).

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Referring to claim 3, Suntola et al discloses molecules adsorbed on the inner walls of the system (col 8, ln 10-17).

Referring to claim 4, Suntola et al discloses a inflow channel 7, this reads on applicant's pre-reactor, upstream from the reaction chambers 13, this reads on applicant's second reaction chamber.

Referring to claim 5, Suntola et al discloses an ALE process, this reads on applicant's ALD, for forming a thin film on substrates 12 placed in the reaction chambers 13.

Referring to claim 7, Suntola et al discloses the piping, this reads on applicant's pre-reactor, is evacuated such that the residual vapor phase reactant is less than 1% (col 5, ln 10-35).

Referring to claim 9, Suntola et al discloses feeding vapor phase reactants alternately (claim 1).

Referring to claim 11, Suntola et al discloses a plurality of vapor phase reactants (claim 1).

Referring to claim 12 and 16, Suntola et al discloses feeding a vapor phase pulse, purging the reactor to less than 1% of residual components and feeding in a second vapor phase pulse and the temperature of the reactor and pre-reactor are the same temperature, as applicant. Suntola et al is silent to the second vapor phase reactant reacts with the residual first vapor phase reactant under conditions conducive to chemical vapor deposition. This is inherent to Suntola et al because Suntola et al teaches a similar residual amount of first reactant, as applicant (note instant claim 22), and similar reactants, as applicant (note pg 7 of the instant specification); therefore a reaction product is inherently formed by CVD conditions.

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Referring to claims 13 and 36, Suntola et al discloses the pre-reactor 7 is placed immediately adjacent the second reactor 13 (Fig 1).

Referring to claim 14, Suntola et al discloses an inflow channel 28 for starting material of group B and an inflow channel 29 for a starting material of group A (col 10, ln 1-30 and Fig 2).

Referring to claims 15 and 36, Suntola et al discloses the inflow channels and intermixing in the inflow slit, this reads on applicant's pre-reactor (col 10, ln 40-55).

Referring to claims 8 and 17, Suntola et al discloses feeding a vapor phase pulse, purging the reactor to less than 1% of residual components and feeding in a second vapor phase pulse and the temperature of the reactor and pre-reactor are the same temperature, as applicant. Suntola et al is silent to the second vapor phase reactant reacts with the residual first vapor phase reactant to form a solid product so as to deplete the residual first vapor phase reactant. This is inherent to Suntola et al because Suntola et al teaches a similar residual amount of first reactant, as applicant (note instant claim 22), and similar reactants, as applicant (note pg 7 of the instant specification); therefore a reaction product is inherently formed by CVD conditions

Referring to claim 18, Suntola et al discloses the "reaction space" includes the reaction chamber and the inflow piping (col 4, ln 29-45); therefore the "reaction space" would inherently be operated at the same temperature for ALE deposition.

Referring to claim 20, Suntola et al discloses molecules are adsorbed on the inner walls of the system, which includes the inflow channel 7. A reaction product is inherently formed in the inflow channel, as discussed previously, which respect to claim 1. The inflow channel 7 reads on applicant's removable medium positioned upstream of the substrate 37 and downstream of a point where both the first and second vapor phase reactants have entered the reaction chamber

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because parts of reactor inherently can be replaced, as evidenced by Soininen et al (US 5,855,680).

Referring to claim 22, Suntola et al discloses less than 1 ppm (col 5, ln 30-31).

Referring to claim 23, Suntola et al discloses less than 1% (col 5, ln 25-26 and Claim 1).

Referring to claim 24, Suntola et al discloses the reaction space is purged with an inactive gas during the interval between the reactant pulses (col 5, ln 10-30).

Referring to claim 25, Suntola et al discloses the reaction space is purged with an inactive gas and evacuated (col 5, ln 10-30).

### ***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suntola et al (US 6,015,590) in view of Soininen et al (US 5,855,680).

Suntola et al discloses all of the limitations of claim 21, as discussed previously, except the reaction product is removed from the pre-reactor by cleaning the walls.

In an apparatus for growing thin films, Soininen et al teaches in an atomic layer epitaxy (ALE) method points where undesired film growth occurs must be subjected at regular intervals to surface cleaning from grown films, this reads on applicant's reaction product is removed from



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the reaction chamber separately from the thin film, or the contaminated parts must be replaced by new ones (col 8, ln 35-50). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Suntola et al with Soininen et al because cleaning reduces part replacement.

Referring to claim 20, the combination of Suntola et al and Soininen et al teaches undesired film growth occurs on other surfaces of a reaction chamber which can be replaced, this reads on applicant's discardable substrate.

Referring to claim 21, the combination of Suntola et al and Soininen et al teaches cleaning the undesired deposition.

10. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suntola et al (US 6,015,590) in view of Mochizuki et al (US 5,166,092).

Suntola et al discloses all of the limitations of claim 26, as discussed previously, except the pressure of the reaction chamber is in the range of 1 to 100 mbar.

In a method of growing a compound film by atomic layer epitaxy, note entire reference, Mochizuki et al teaches a pressure dependency of the thickness of a grown GaAs layer per material supply cycle and a satisfactory GaAs molecular layer is obtainable in a pressure range of approximately 7 Torr to 60 Torr (9.3 to 80 mbar) (col 6, ln 65 to col 7, ln 5 and Fig 10). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Suntola et al with Mochizuki et al's pressure to produce a satisfactory GaAs molecular layer.

The combination of Suntola et al and Mochizuki et al teach a pressure range of 9.3 to 80 mbar. The combination of Suntola et al and Mochizuki et al does not teach a pressure range of 1 to 100 mbar. Overlapping ranges are held to be obvious (MPEP 2144.05).

### *Response to Arguments*

11. Applicant's arguments filed 1/22/2004 have been fully considered but they are not persuasive.

Applicant's argument that Suntola does not teach a first substrate and a second substrate in a reaction chamber, said first substrate being positioned downstream a point in the reaction chamber where both said first and second phase reactant have entered is noted but is not found persuasive. Suntola et al teaches vapor phase reactant pulses are fed alternately into a inflow channel 7 (col 9, ln 10-25) and molecules are adsorbed on the inner walls of the system (col 8, ln 10-17); therefore the inner walls of the inflow channel reads on applicant's first substrate. The walls of the inflow channel, the first substrate, are also upstream of the substrate 12, which read on applicant's second substrate.

Applicant's argument that Suntola does not teach the reaction product is deposited on a medium positioned upstream of said substrate and downstream of a point where both the first and second vapor phase reactants have entered the reaction chamber is noted but is not found persuasive. Suntola et al teaches vapor phase reactant pulses are fed alternately into a inflow channel 7 (col 9, ln 10-25) and molecules are adsorbed on the inner walls of the system (col 8, ln 10-17); therefore the inner walls of the inflow channel reads on applicant's removable medium because parts of a reaction chamber can be replaced with new ones, as taught by Soininen et al

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(US 5,855,680), note column 8, lines 35-50. Suntola does teach a medium, the walls of the inflow channel, positioned upstream of a substrate and downstream of a point where both the first and second vapor phase reactants have entered.

12. Applicant's arguments with respect to claim 36 have been considered but are moot in view of the new ground(s) of rejection.

### *Conclusion*

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Suntola et al (US 4,389,973) teaches an apparatus of ALE comprising a reaction zone 18 and a substrate or substrates 11 place in the reaction zone (col 2, ln 5-67 and Fig 2).

Lan et al (US 4,780,174) teaches substrates held in series along the flow path of reactants (Fig 1), which reads on applicant's flowing of a first substrate and subsequently over a second substrate.

Lofgren et al (WO 99/51797) teaches at least two substrates in series along a gas flow path increases the growth rate in the sense that more objects may be grown at the same time (pg 5, ln 15-35).

14. This is a continuation of applicant's earlier Application No. 09/836,674. All claims are drawn to the same invention claimed in the earlier application and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the

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earlier application. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action in this case. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no, however, event will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song  
Examiner  
Art Unit 1765

MJS

NADINE G NORTON  
SUPERVISORY PAIR EXAMINER

